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BIOLOGICAL EVALUATION TO ASSESS MOUNTAIN PINE BEETLE ACTIVITY IN STAND 16, COMPARTMENT 44 ON THE FLAMING GORGE RANGER DISTRICT, ASHLEY NF - 1983

by

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INTRODUCTION

Mountain pine beetle, Dendroctonus ponderosae has caused extensive mortality in lodgepole and ponderosa pine stands on the Ashley NF for several decades. Epidemic levels of the beetle, recorded since the 1940's, have continued to cycle through the Forest, removing most of the larger diameter trees in infested stands. The most recent outbreak began in the early 1970's around Greendale Junction, and is causing extensive mortality in the Flaming Gorge NRA. The heaviest mortality has accumulated since 1980 with a total of 5.2 million trees killed.

At the request of Dick Rosemeir, Forester, Ashley NF-SO, FPM conducted an evaluation of Stand 16, Compartment 44 to assess the impact of mountain pine beetle and provide recommendations to the Forest for minimizing tree losses from mountain pine beetle. The purpose of this evaluation is to (1) describe the current situation; (2) discuss projected losses; and (3) provide recommendations for minimizing losses to mountain pine beetle.

GENERAL INFORMATION

INSECT: Mountain pine beetle, Dendroctonus ponderosae Hopkins.

HOSTS: Ponderosa pine, Pinus ponderosa Laws.
Lodgepole pine, Pinus contorta var. latifolia Engelmann

LOCATION: The Project area encompasses Stand 16, Compartment 44 on the Flaming Gorge Ranger District, Ashley NF. The stand is located along State Highway 44 northeast of Meadow Park and consists of 101 acres (Figure 1). The entire Project is within the Flaming Gorge National Recreation Area.

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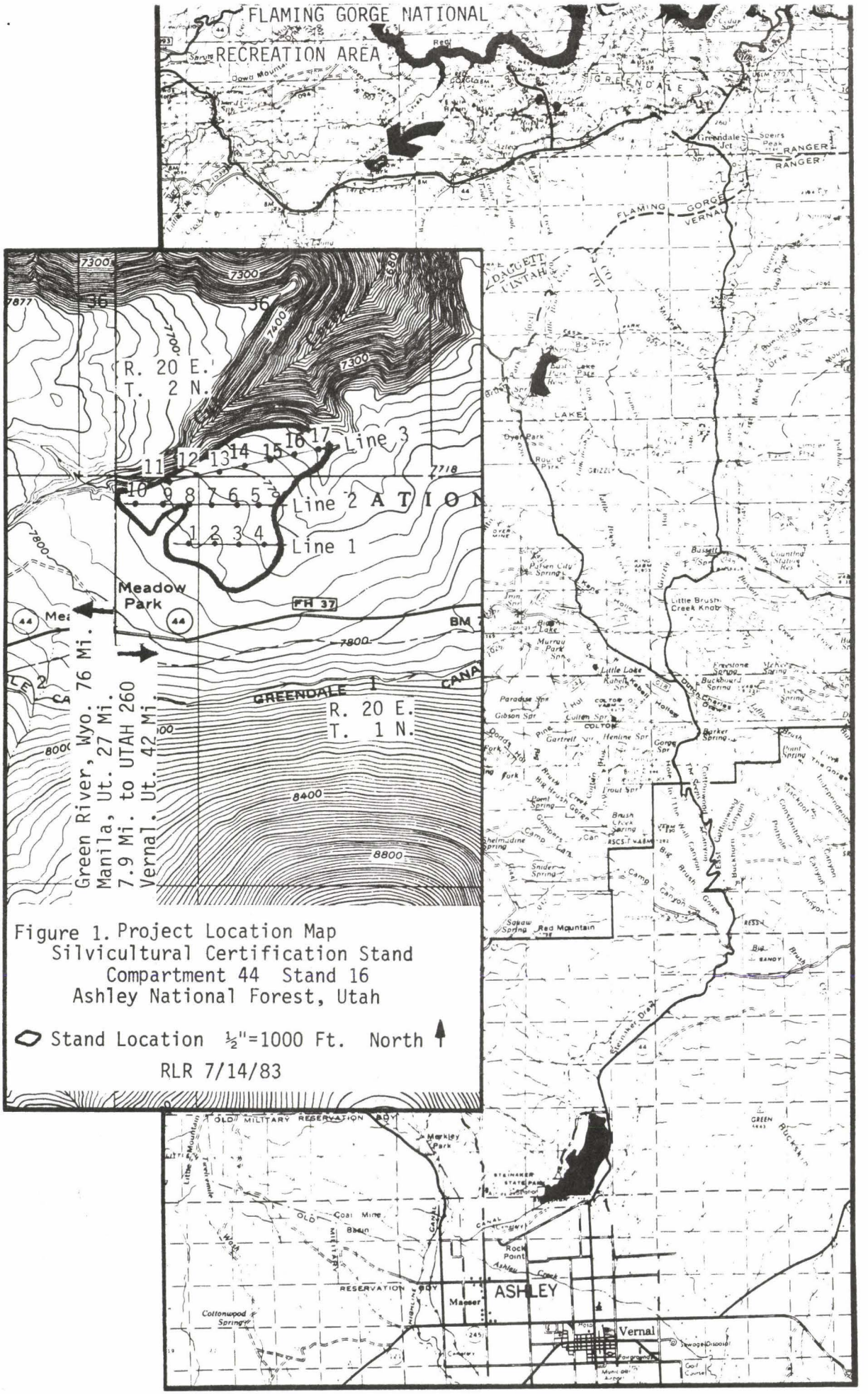


Figure 1. Project Location Map
Silvicultural Certification Stand
Compartment 44 Stand 16
Ashley National Forest, Utah

Stand Location ½"=1000 Ft. North

RLR 7/14/83

LIFE HISTORY: Mountain pine beetle has a 1-year cycle. Adults fly and attack new trees in midsummer, usually mid-July to mid-September. The beetles carry a bluestain fungus that infects and hastens death of the attacked trees. Successfully attacked trees are quickly killed, but do not fade for nearly a year. The beetles overwinter as larvae, and complete their development the following spring and early summer (Stevens et al. 1975).

Outbreaks of mountain pine beetle in ponderosa pine rarely develop suddenly; they generally build up over several years. Endemic infestations typically involve less than five trees per acre per year and generally occur in widely scattered single trees or in groups of two or three trees. In the first year of an outbreak, about five to ten trees per acre are killed, and group kills of three to five trees are common. Subsequently, the number of infested trees increases to a peak level of about 30 to 150 trees per acre per year in the third to fifth years and then declines. Within a stand, the duration of an outbreak from onset through collapse is generally about 6 to 8 years tending to be shorter on good sites and longer on poor sites (Sartwell 1971).

METHODS

The survey consisted of three compass transects through the Project area (Figure 1). Variable radius plots (BAF 10) were established at 5 chain intervals along the transects using a Relascope. Tree data were collected on 17 plots within the Project area.

All trees within each plot were examined and the following information was recorded: tree species, DBH, total height in feet, general condition (live, or dead) and presence of insect or disease infestation. Bark was removed to expose beetle galleries to determine the year of attack. Any noticeable disease infecting the trees was recorded including a dwarf mistletoe rating (Hawksworth 1977) to estimate levels of dwarf mistletoe infection. Two roots on opposite sides of each dead or symptomatic tree were excavated and examined for evidence of root disease. Tree boles were examined for signs and symptoms of heartrot, including conks and large wounds. Basal area, stems per acre, and cubic foot volumes of new beetle infested, old dead, and live green trees were calculated.

RESULTS

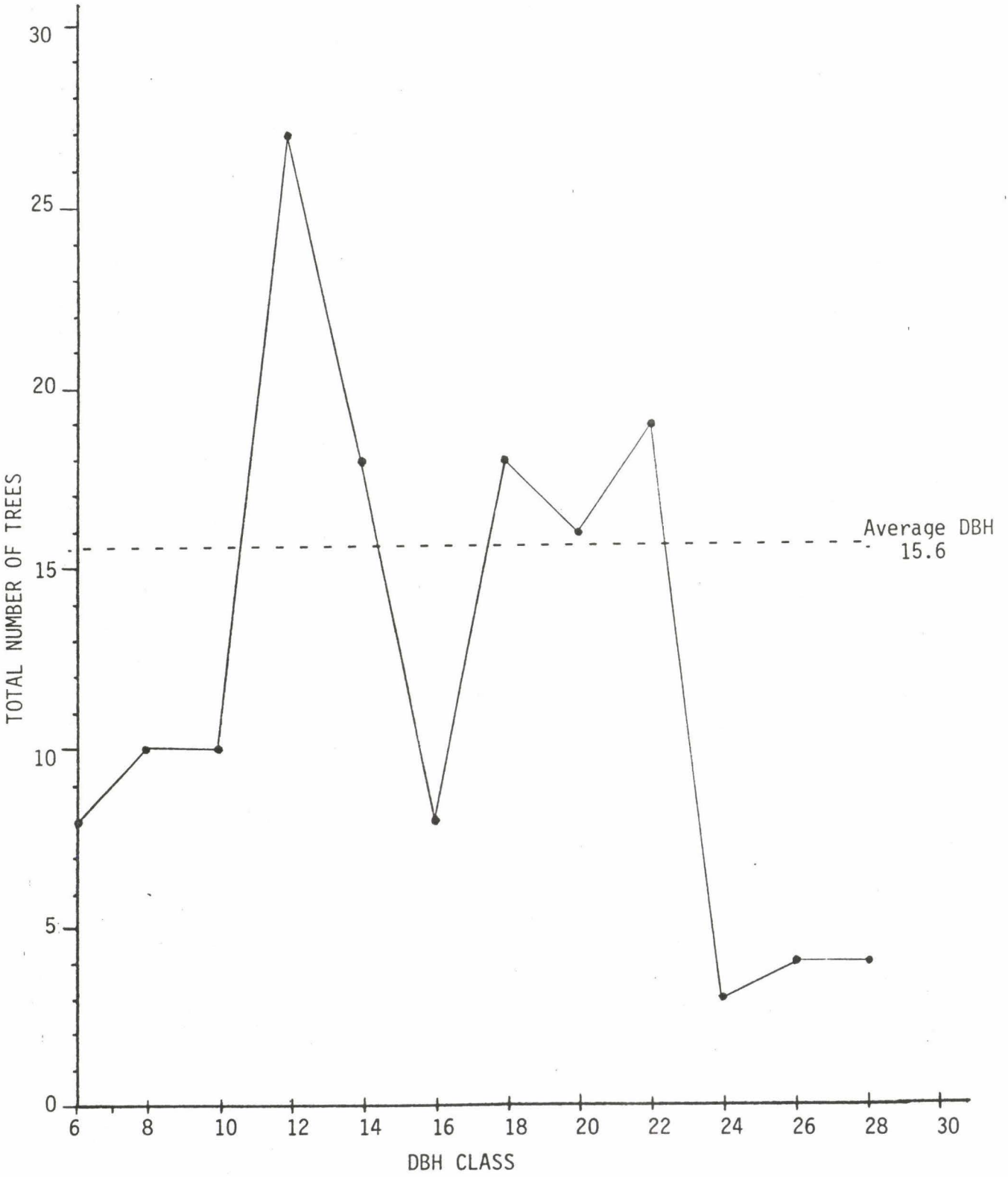
The Project area is almost entirely composed of ponderosa pine with the exception of several lodgepole pine and aspen. Basal area for ponderosa pine ranges from 40-220 sq. ft. per acre with an average of 85 sq. ft. per acre. Total volume per acre is 1232 cu. ft. of which 78 percent is live, 13 percent is green-infested, and 9 percent is dead (Table 1). The average DBH for ponderosa pine is 15.6 inches with distribution scattered from 6 inches to 28 inches (Figure 2).

Beetle-attacked trees (infested and dead) represent 11 percent of the stems per acre. The majority of trees attacked include DBH classes 12 to 22 which represent 94 percent of the stems per acre attacked and 10 percent of the total stems per acre. No incidence of dwarf mistletoe or root rots was detected during the survey.

Table 1: Mean stems per acre (S/A) and cubic foot volume per acre (CF/A) of ponderosa pine by diameter class and tree condition in Compartment 44, Stand 16, Ashley NF--1983.

Diameter Class (in.)	Height (ft.)	Live		Infested		Dead	
		S/A	CF/A	S/A	CF/A	S/A	CF/A
6	23	23.9	37.6	-	-	-	-
8	39	16.8	81.8	-	-	-	-
10	37	10.8	77.9	-	-	-	-
12	50	8.9	116.5	3.0	38.8	.75	9.7
14	54	8.8	174.6	1.1	21.8	-	-
16	62	2.1	64.4	-	-	1.3	38.6
18	66	4.7	194.6	1.0	41.7	.33	13.9
20	68	3.5	187.7	.54	28.9	.27	14.4
22	72	2.7	184.5	.67	46.1	.45	30.7
24	72	.56	46.5	-	-	-	-
26	74	.16	16.1	.16	16.1	.32	32.1
28	76	.41	49.9	.14	16.7	-	-
TOTAL ALL CLASSES		83.5 (89%)	1232.2 (78%)	6.6 (7%)	210.1 (13%)	3.4 (4%)	139.6 (9%)

Figure 2. Diameter distribution of ponderosa pine for Stand 16, Compartment 44 on the Flaming Gorge Ranger District, Ashley National Forest - 1983.



DISCUSSION

Mountain pine beetle is and has been a natural part of the ponderosa pine ecosystem for thousands of years. There is no reason to expect total devastation of the ponderosa pine type, however, tree killing has been, and will continue to be, severe in overstocked and marginal stands.

The beetles usually kill ponderosa pines in groups. These groups enlarge as subsequent generations of beetles continue the infestation, or new adjacent groups may be attacked. Groups may range from 2 or 3 to 100 or more trees.

Generally, three stand characteristics affect susceptibility to beetle attack: (1) stand structure, (2) average DBH of the ponderosa pine component, and (3) stand density as expressed by average basal area per acre (Stevens, et al. 1980). In Utah, outbreaks usually develop in multistoried/all-aged stands of ponderosa pine with basal area over 80 sq. ft. per acre, and with most trees over 8 inches DBH.

The Project area meets the general stand characteristics of a mountain pine beetle susceptible stand. The stand is multistoried with an average basal area of 84 sq. ft. per acre, and an average tree diameter of 15.6 inches. Present tree losses are occurring in many of the higher density tree groups which range up to 220 sq. ft. of basal area per acre. Under present management, the beetle infestation will continue to intensify and spread throughout the pole and sawtimber pine in the stand to other adjacent areas. Losses will continue until 40-50 percent of the ponderosa pine stems per acre are removed with the majority of the losses occurring in the 8 to 14 inch diameter trees (Lessard 1981, McCambridge 1982).

RECOMMENDATIONS

The impact of epidemic mountain pine beetle populations can be prevented or substantially reduced through silvicultural techniques. Management objectives for the Flaming Gorge NRA require maintaining a multistoried stand for visual and aesthetic values. These objectives can be achieved through uneven-aged management. Uneven-aged stands are less likely to sustain a mountain pine beetle epidemic than even-aged stands. If an epidemic does occur in an uneven-aged stand, losses to the mountain pine beetle will be 30-50 percent less than the most susceptible even-aged stand with comparable stocking (Lessard 1981).

Overall management objectives may be achieved using several alternatives. However, susceptibility to beetle attacks will be primarily reduced by maintaining stocking at 80 sq. ft. of basal area or less with an array of diameter sizes and age classes.

Thinning stands to a low density and allowing them to grow back to optimum density before the next thinning or harvest at or below the recommended rotation age will help promote vigorous tree growth and best prevent outbreaks. In addition, removal of green-infested and dead trees through logging will minimize mortality from bark beetles and maximize timber values.

Caution should be taken during logging operations to prevent build-up of pine engraver beetle populations in slash. Damage by Ips sp. can be prevented or minimized by:

a. Utilizing material to a 4-inch top.

b. Timing management activities to permit slash to dry. It is best to cut trees in mid to late summer and scatter slash to promote drying.

If winter or spring slash is created, be prepared to provide a continuous supply of green slash from June through August to keep the Ips sp. in slash until rapid drying can be obtained during hot summer days.

LITERATURE CITED

Hawksworth, F.G. 1977. The 6-class Drawf Mistletoe Rating Sytem. USDA Forest Service, General Technical Report RM-48. 7p.

Lessard, G. 1981. Factors Affecting Ponderosa Pine Stand Susceptibility to Mountain Pine Beetle in the Black Hills, 1981. USDA Forest Service Technical Report R2-26. 16p.

McCambridge, W.F., F.G. Hawksworth, C.B. Edminster, and J.G. Laut. 1982. Ponderosa Pine Mortality Resulting from a Mountain Pine Beetle Outbreak. USDA Forest Service Res. Paper RM-235. 7p.

Sartwell, C. 1971. Thinning Ponderosa Pine to Prevent Outbreaks of Mountain Pine Beetle. Proceedings: Precommercial Thinning of Coastal and Intermountain Forests in the Pacific Northwest. February 3 and 4, 1971. Washington State University, Pullman, WA. Pp. 41-52.

Stevens, R.E., C.A. Meyers, W.F. McCambridge, G.L. Downing and J.G. Laut. 1975. Mountain Pine Beetle in Front Range Ponderosa Pine: What It's Doing and How to Control It. USDA Forest Service, General Technical Report RM-7. 3p.

Stevens, R.E., W.F. McCambridge and C.B. Edminister, 1980. Risk Rating Guide for Mountain Pine Beetle in Black Hills Ponderosa Pine. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Res. Note RM-385. 2p.